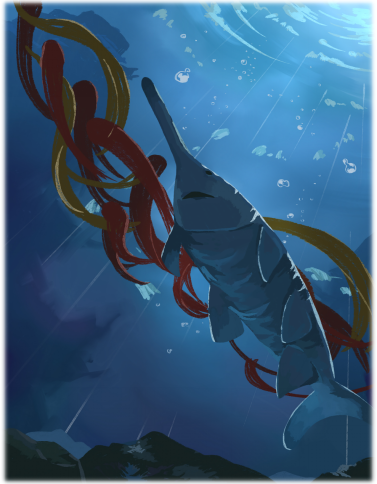
YANGTZE

Tongji University, Shanghai, China

Name reference: *Yangtze River*

Pattern Design: *Chinese sturgeon*

TONGJI UNIVERSITY YANGTZE

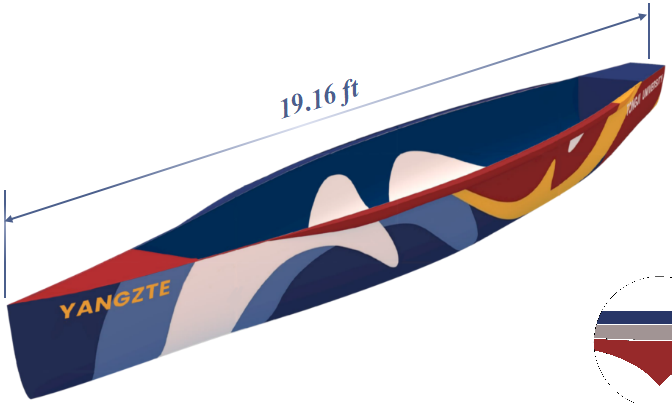


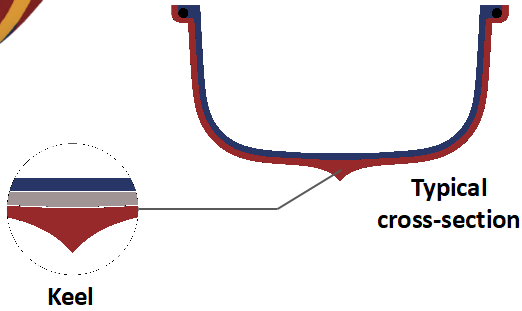
Contents

Hull Design and Structural Analysis

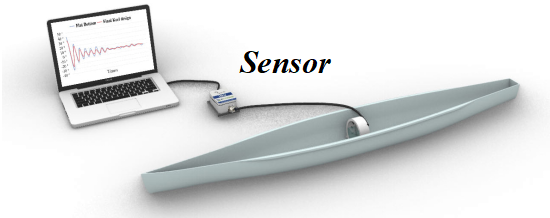
- Stability
- Speed and flexibility
- Safety

Stability

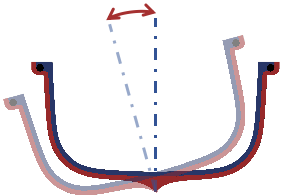




Stability



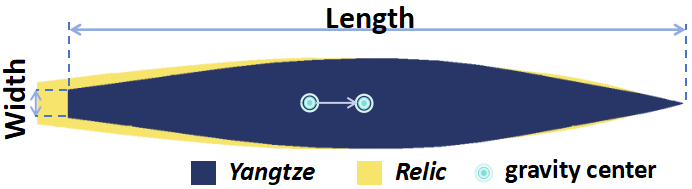
Scale Experiment



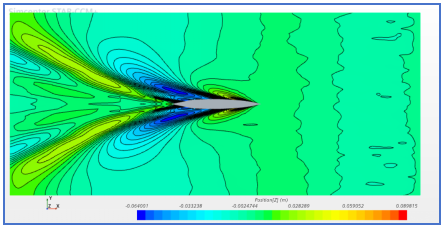
Average inclination recovery time ↓ 9%

Average fluctuation angle ↓ 38%

Speed and flexibility



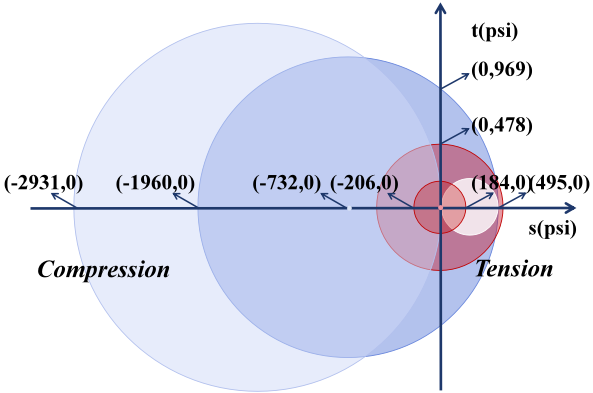
Top view of the hull design



CFD analysis

Canoe	Width of Stern	Length	Straight-Line Resistance (FN*=0.45)
Relic(2023)	11.81 in.	19.8 ft.	37.39 lbf.
Yangtze(2024)	8.58 in. 27%↓	19.16 ft. 3.2%↓	36.73 lbf.

Safety



More accurate structural analysis

Mohr's Criterion

Composite Stress State

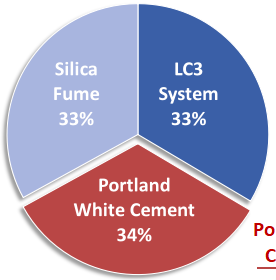
Mix Design

Balance between Strength and Density

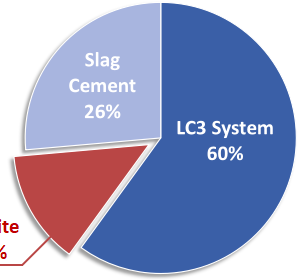
Impermeability

Sustainability

Slag Cement - LC³



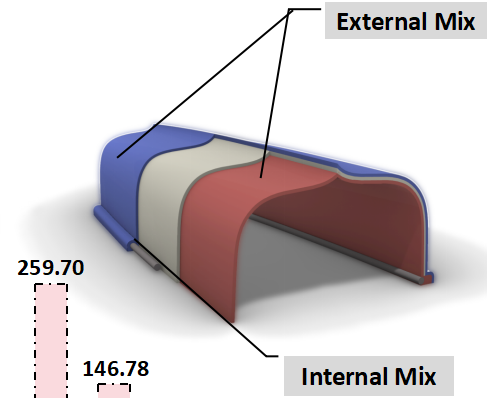
Last year's LC³ System

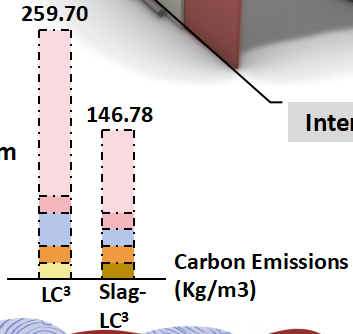


Slag Cement - LC³ System

Greenhouse Gas emissions ↓ 40+%

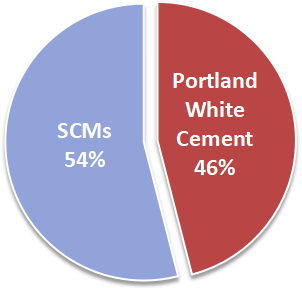
Embodied Energy ↓ 30+%



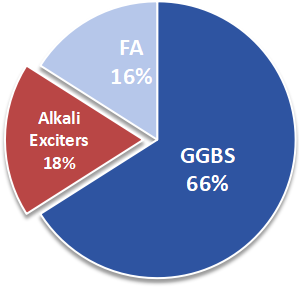


EGC

Engineered Geopolymer Composites(EGC)



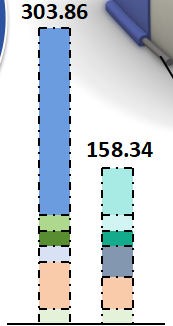
ECC

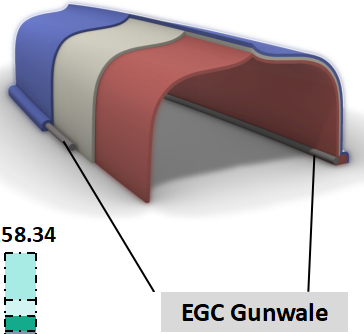


EGC

With NO Portland White Cement!

Greenhouse Gas emissions ↓ 50%

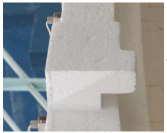


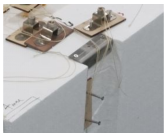


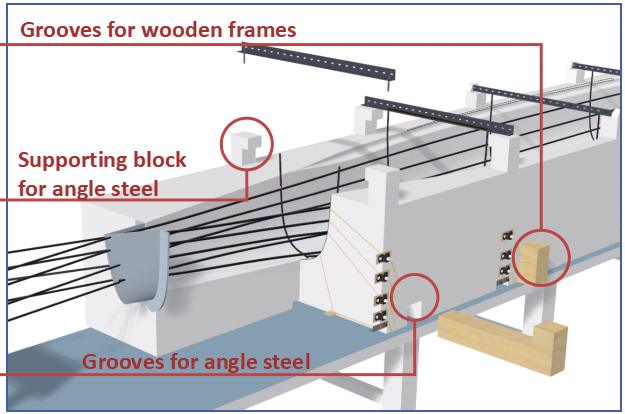
Construction

- Efficiency
- Mold Reusability
- Elaboration

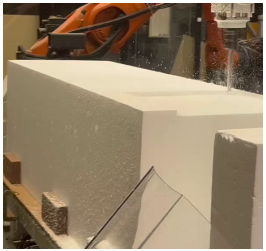
Efficiency







One-piece cutting of different parts

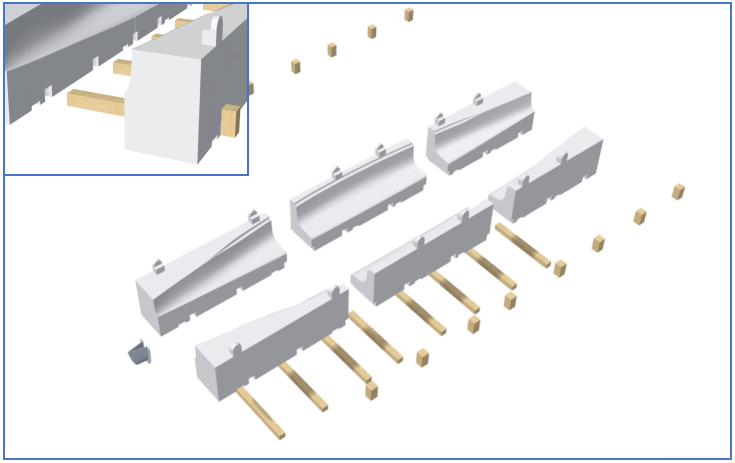


Labor Hours for
Mold Preparations

Reusability

Mold system

- Mechanical connection used
- QUICK and ACCURATE
- Assembling and disassembling for reuse



Reusability

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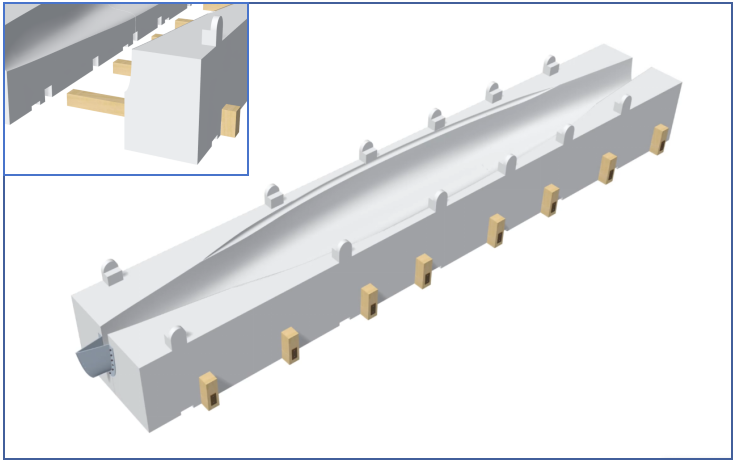
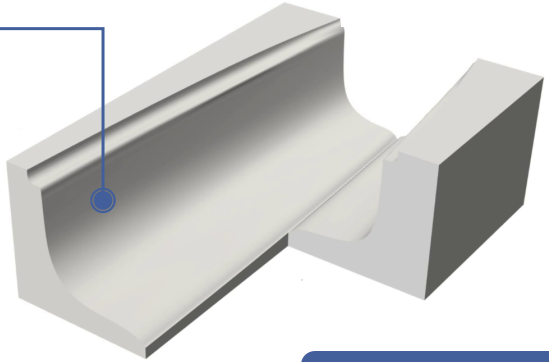


Elaboration

Epoxy Resin

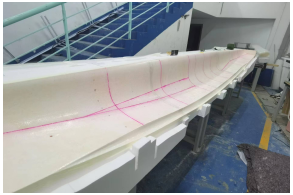
Harder Surface

No Wearing-Out



Surface treatment system

Elaboration



Epoxy Resin

Harder Surface

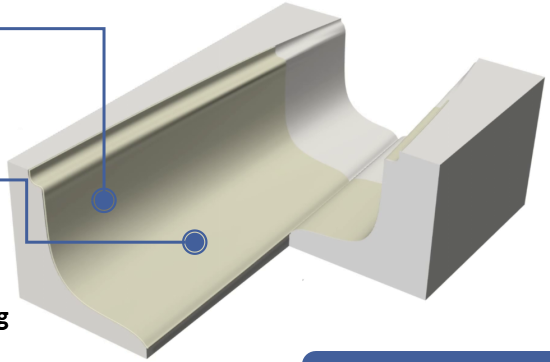
No Wearing-Out

PVC Film

Smoother Surface

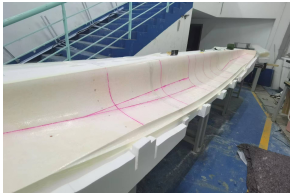
Fits the mold curve

No warping or Swelling



Surface treatment system

Elaboration



Epoxy Resin

Harder Surface

No Wearing-Out

PVC Film

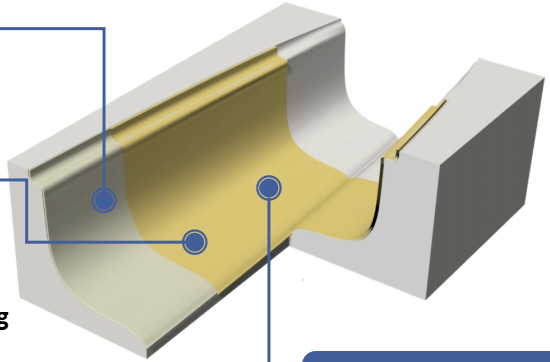
Smoother Surface

Fits the mold curve

No warping or Swelling

Car Wax

Easier Demolding



Surface treatment system

Project Management

2023.7
Preliminary design

2023.9
Experimental canoe casting

2023.10
Canoe (final) casting

2023.12
Polishing, training, presentation

2024.2
Shipping

2024.4
Mid-Pacific

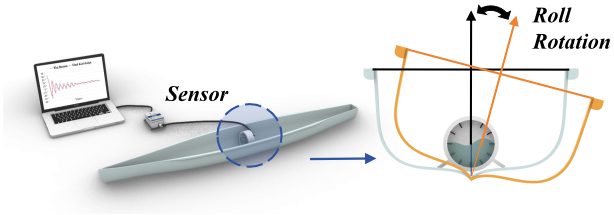
Thank you!

2024 TONGJI
CONCRETE CANOE TEAM

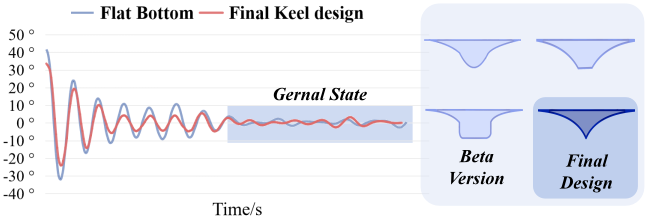
Thank you!

2024 TONGJI
CONCRETE CANOE TEAM

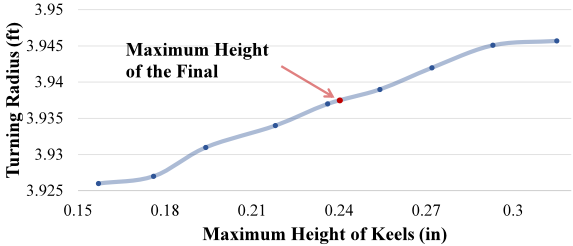
Scale experiment



Equipments of the Experiment

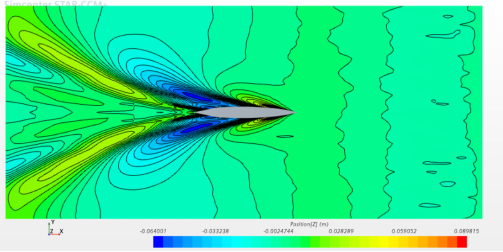


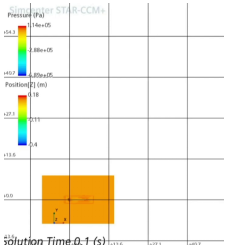
Processed Sensor Data of Scale Experiment



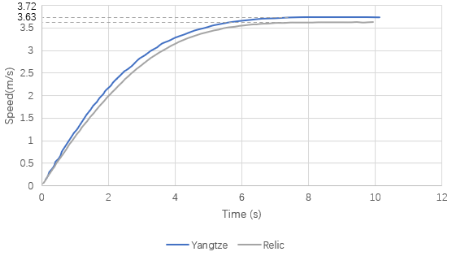
Turning Radius – Maximum Height of Keels Curve

CFD Analysis

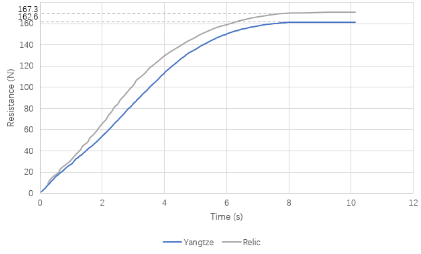




CFD Processing Image



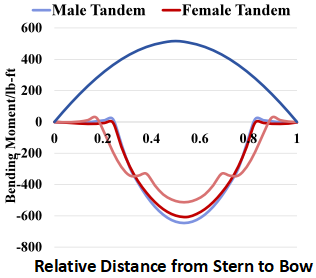
Speed-Time Diagram



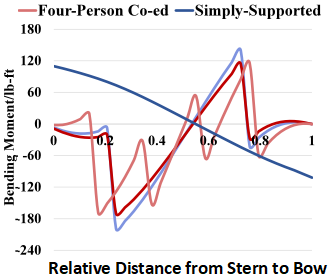
Resistance-Time Diagram

Structural Analysis

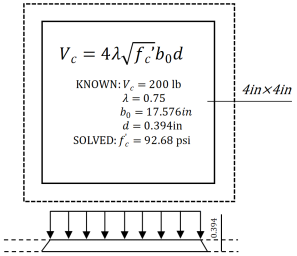
Bending Moment and Shear Force Diagram



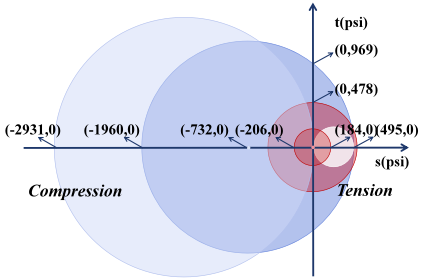
Bending Moment and Shear Force Diagram



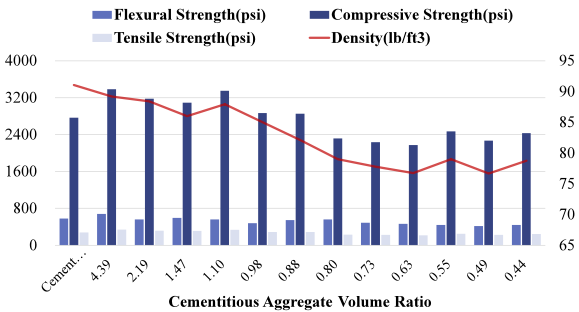
Punching Shear



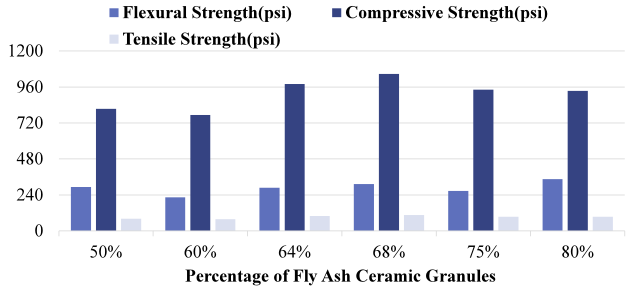
Failure Envelope Analysis



Mix Design

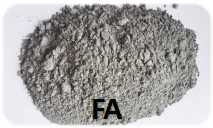


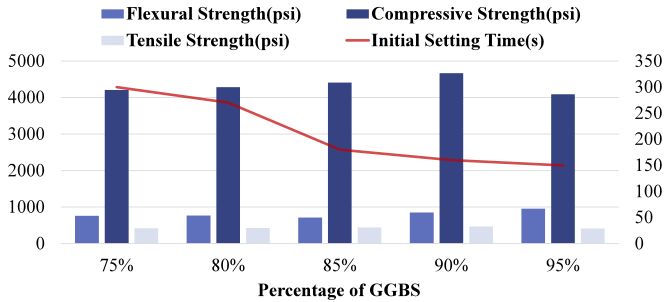
Influence of Cement-Aggregate Ratio on Strength and Density



Influence of Fly Ash Ceramic Granules on Strength and Density

Engineered Geopolymer Composites



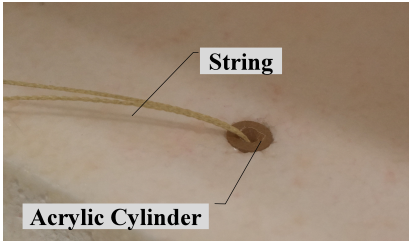


Influence of GGBS on Strength and Initial Setting Time

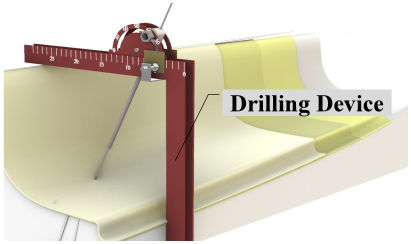
Impermeability

- **Standard Impermeability Testing**
- **Step-by-step Water Pressure Method**
- **130.5 psi**

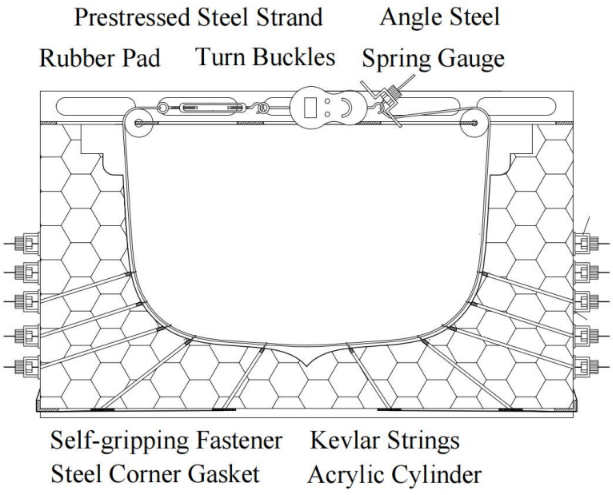
Prestressing System



Holes Limiting

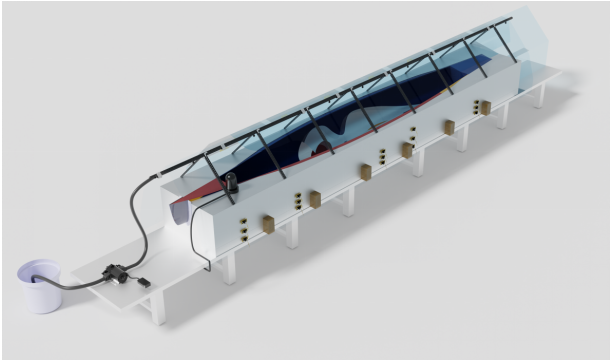


Drilling Device

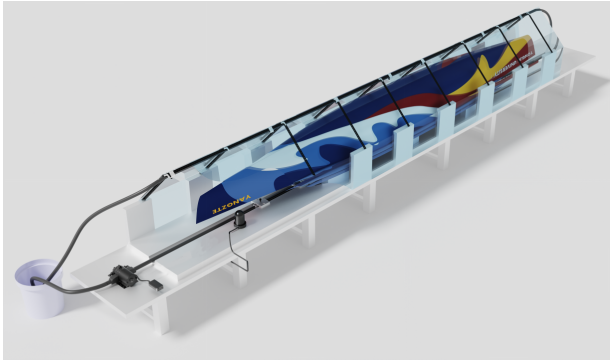


Typical Cross-section

Curing System



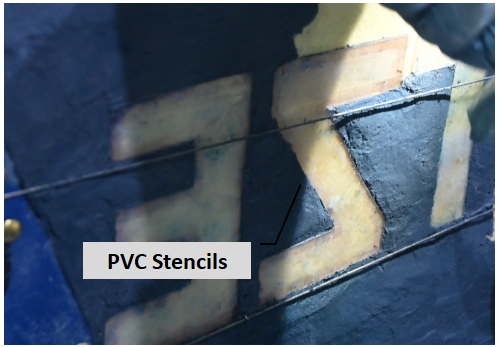
Stage 1



Stage 2

Aesthetic Casting

Boundary



Letter Casting

Water Treatment System